LAPS and RUC20 Atmospheric Analyses Archived as part of CLPX

Glen E. Liston

Department of Atmospheric Science
Colorado State University
Fort Collins, Colorado

Atmospheric Analysis

Goal: Continuous (in space and time) representations of state variables.

1) Most field observations are spatially and temporally irregular.
2) Use a data assimilation procedure to produce a continuous (in *x*, *y*, *z*, and *t*) and physically-consistent representation of the atmosphere from a collection of irregular observations.

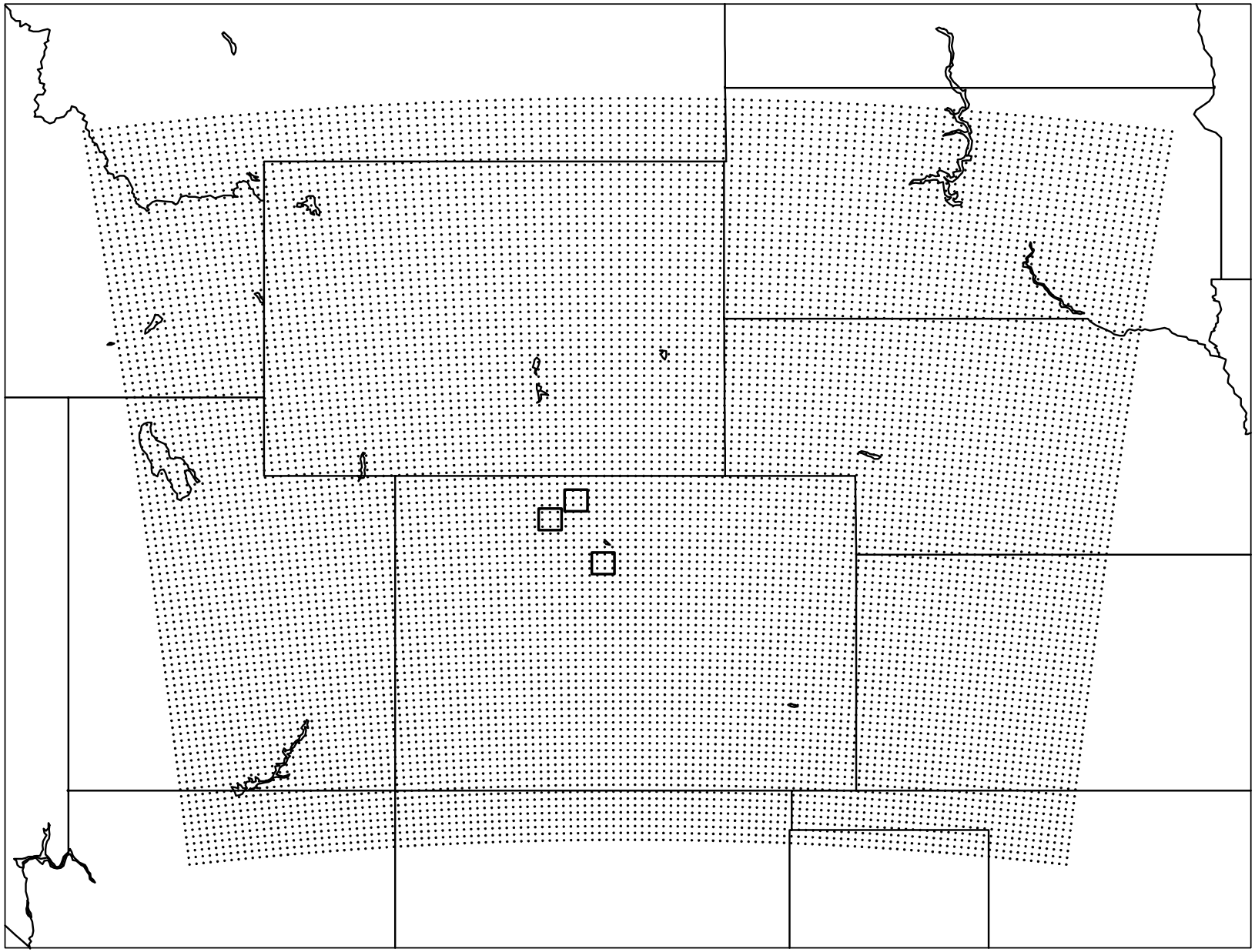
Data assimilation:

1) Applies filters to extract the signal from the generally noisy observations
2) Performs interpolation in space and time
3) Uses atmospheric models to construct state variables that were not sampled by the observational network and ensure the analyzed data are physically consistent

Result: An optimal combination of the available observations and the model representation.

1) The analysis data set contains the advantage of spatial and temporal continuity
2) Includes the possible disadvantage of being removed from the original observations

LAPS Grid Points and CLPX MSAs



LAPS domain and topography (m)
and CLPX MSAs

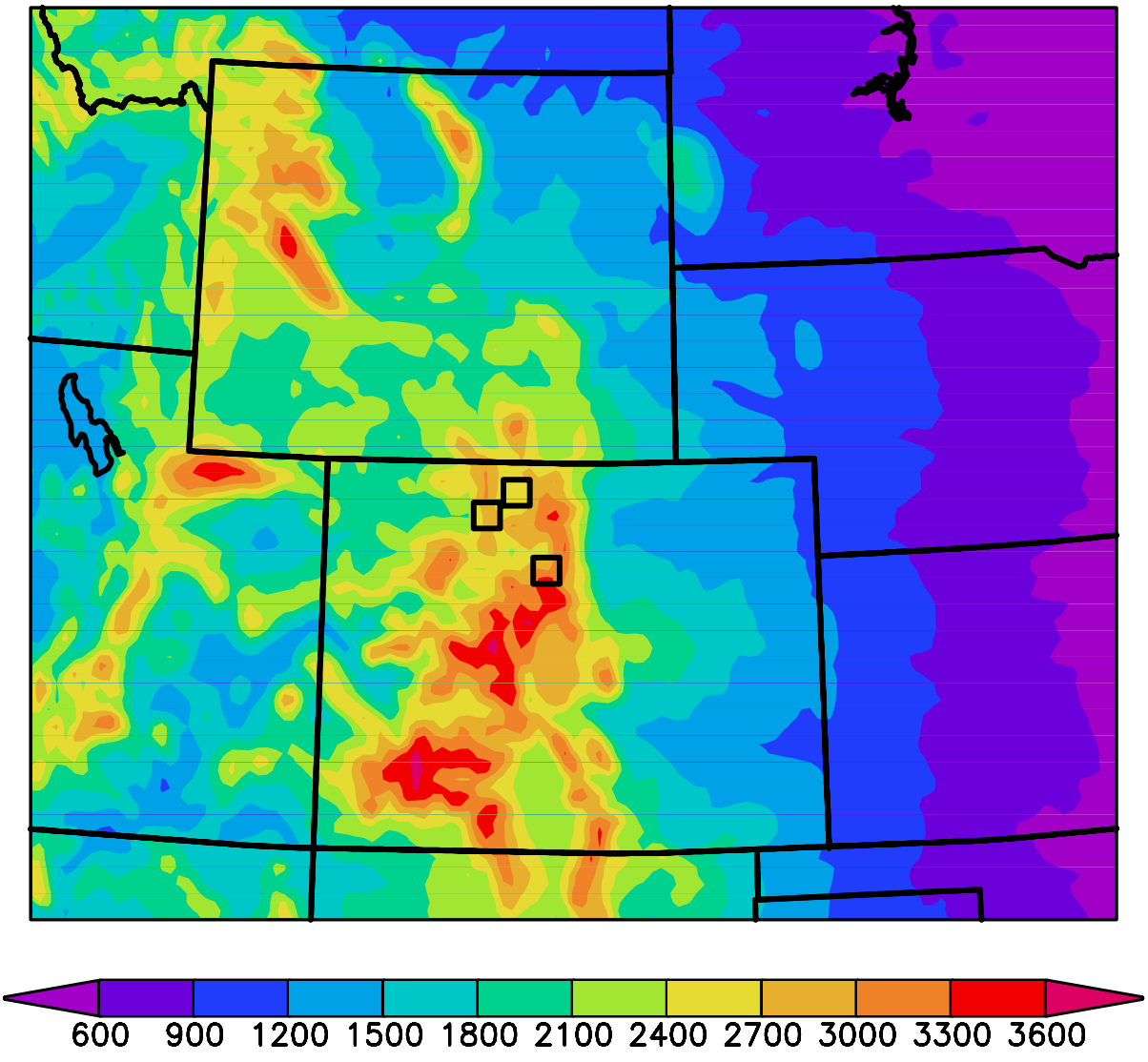
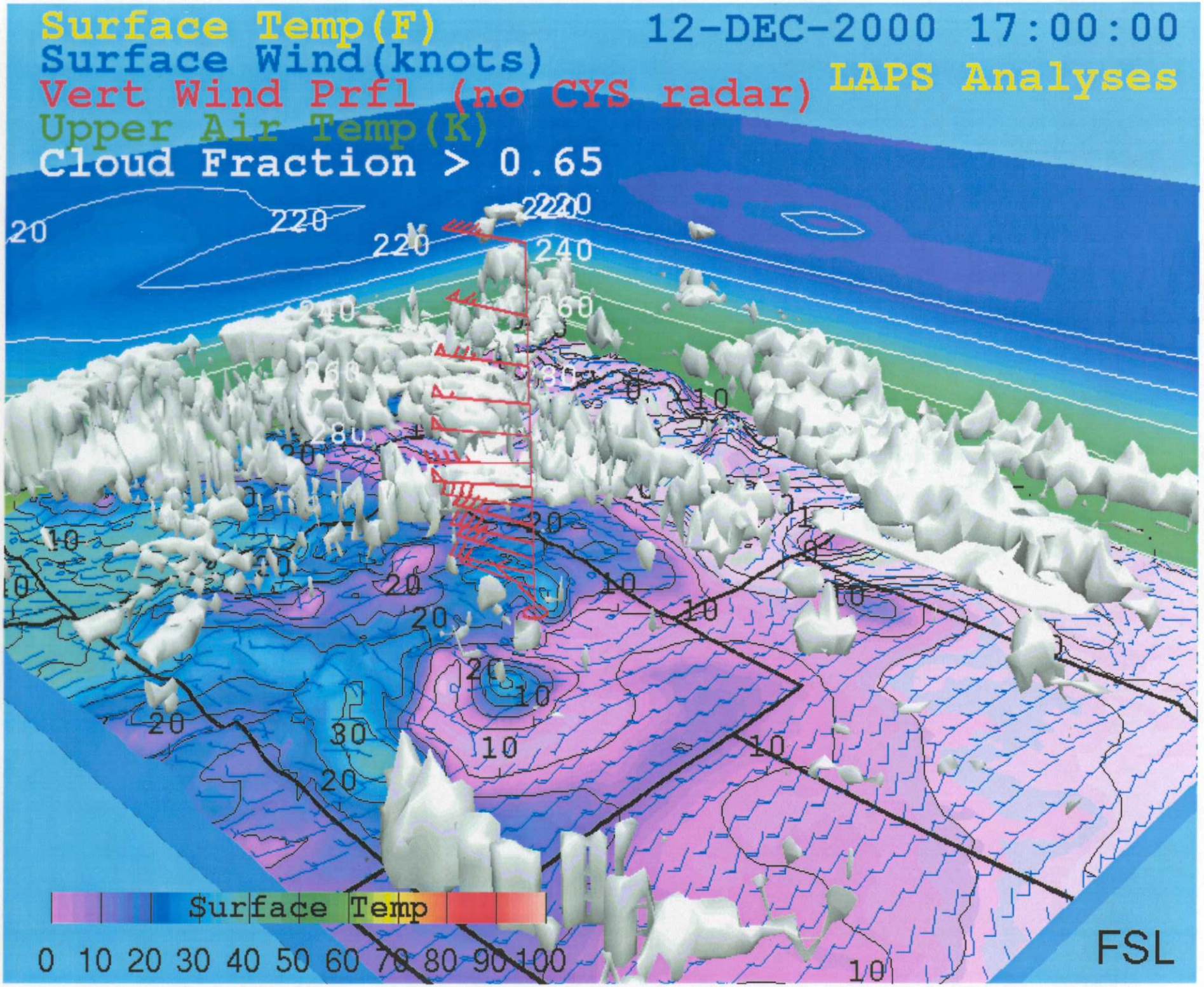
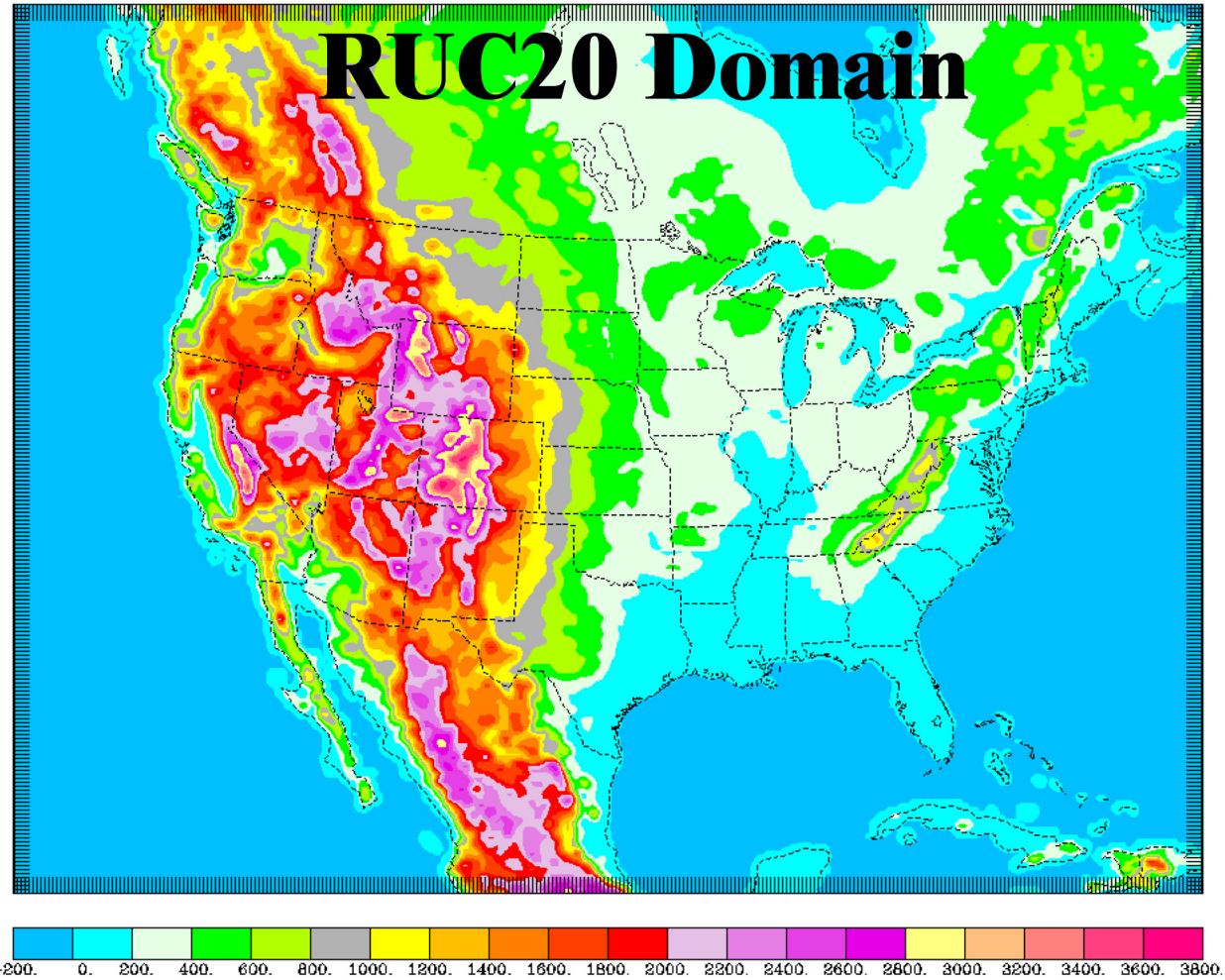


Table 1: Summary of LAPS variables saved within the CLPX data archive.

1-D Surface Fields:	
u Component of Surface Wind (m s^{-1})	Ground Temperature (K)
v Component of Surface Wind (m s^{-1})	60 Minute Snow Accum (m)
1500m Pressure (Pa)	Storm-Total Snow Accum (m)
Surface Temperature (K)	60 Minute Liquid Precipitation Accum (m)
Surface Dew Point Temperature (K)	Storm-Total Liquid Precipitation Accum (m)
Vertical Velocity (m s^{-1})	Integrated Total Precipitable Water Vapor (m)
Relative Humidity (%)	Cloud Base (m)
MSL Pressure (Pa)	Cloud Top (m)
Temp Advection (K s^{-1})	Cloud Ceiling (m)
Potential Temperature (K)	Cloud Cover (0-1)
Equivalent Potential Temperature (K)	Cloud Analysis Implied Snow Cover (0-1)
Surface Pressure (Pa)	Clear Sky Water Temperature (K)
Vorticity (s^{-1})	IR Channel 4 (11.2u) b-temp: averaged (K)
Mixing Ratio (g kg^{-1})	IR Channel 2 (3.9u) b-temp: averaged (K)
Moisture Convergence (g kg^{-1} s^{-1})	LAPS Derived Albedo (0-1)
Divergence (s^{-1})	Soil Moisture, 3 Levels (m m^{-1})
Potential Temperature Advection (kg s^{-1})	Cumulative Infiltration Volume (m)
Moisture Advection (g kg^{-1} s^{-1})	Depth To Wetting Front (m)
Surface Wind Speed (m s^{-1})	Wet/Dry Grid Point (-)
Colorado Severe Storm Index (-)	Evaporation Data (m s^{-1})
Surface Visibility (m)	Snow Cover (0-1)
Fire Danger (-)	Snow Melt (m^3 m^{-3})
Heat Index (-)	Wetting Front Soil Moist Content (m^3 m^{-3})
3-D Upper-Air Fields:	
Geopotential Height (m)	u Component of Wind (m s^{-1})
Temperature (K)	v Component of Wind (m s^{-1})
Specific Humidity (kg kg^{-1})	Wind omega (Pa s^{-1})
Relative Humidity (%)	Fractional Cloud Cover (0-1)
Relative Humidity with respect to liquid (%)	


Surface Temp(F)
Surface Wind(knots)
Vert Wind Prfl (no CYS radar)
Upper Air Temp(K)
Cloud Fraction > 0.65
12-DEC-2000 17:00:00
LAPS Analyses
Surface Temp
0 10 20 30 40 50 60 70 80 90 100
FSL


RUC20 Domain
−200. 0. 200. 400. 600. 800. 1000. 1200. 1400. 1600. 1800. 2000. 2200. 2400. 2600. 2800. 3000. 3200. 3400. 3600. 3800.

Other Atmospheric Analyses Products:

RUC20 – 20 km grid covering the US, October 2002 through present

Two RUC20 Options:

1) **Surface and Upper-Air Variables**

2) **MORDS (Model Output Reduced Data Set) Surface Variables**

Third Option: Make use of the following

1) **NCEP Eta outputs, 40-km data covering the US, ~1995-present.**

2) **FSL MAPS (Mesoscale Analysis and Prediction System) data. 40-km data covering the US, ~1997-present.**

(These are archived at NCAR as part of the GCIP Model Output Archive.)